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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 10555-054		FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US03/03323	International filing date (day/month/year) 03 February 2003 (03.02.2003)	Priority date (day/month/year) 01 February 2002 (01.02.2002)	
International Patent Classification (IPC) or national classification and IPC IPC(7): H01L 31/072, 31/109, 31/0328 and US Cl.: 257/183, 183, 185, 186, 190, 191			
Applicant PICOMETRIX, INC.			
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>4</u> sheets, including this cover sheet.</p> <p><input type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of ___ sheets.</p>			
<p>3. This report contains indications relating to the following items:</p> <p>I <input checked="" type="checkbox"/> Basis of the report</p> <p>II <input type="checkbox"/> Priority</p> <p>III <input type="checkbox"/> Non-establishment of report with regard to novelty, inventive step and industrial applicability</p> <p>IV <input type="checkbox"/> Lack of unity of invention</p> <p>V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p>VI <input type="checkbox"/> Certain documents cited</p> <p>VII <input checked="" type="checkbox"/> Certain defects in the international application</p> <p>VIII <input type="checkbox"/> Certain observations on the international application</p>			
Date of submission of the demand		Date of completion of this report 18 March 2004 (18.03.2004)	
Name and mailing address of the IPEA/US Mail Stop PCT, Attn: IPEA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703) 305-3230		Authorized officer Minh-Loan T. Tran <i>Pagittano</i> Telephone No. (571) 272-1922	

Form PCT/IPEA/409 (cover sheet)(July 1998)

Best Available Copy

I. Basis of the report**1. With regard to the elements of the international application:***

- ☒ the international application as originally filed.
- ☒ the description:
pages 1-9 _____ as originally filed
pages NONE _____, filed with the demand
pages NONE _____, filed with the letter of _____.
- ☒ the claims:
pages 10-13 _____, as originally filed
pages NONE _____, as amended (together with any statement) under Article 19
pages NONE _____, filed with the demand
pages NONE _____, filed with the letter of _____.
- ☒ the drawings:
pages 1-2 _____, as originally filed
pages NONE _____, filed with the demand
pages NONE _____, filed with the letter of _____.
- ☐ the sequence listing part of the description:
pages NONE _____, as originally filed
pages NONE _____, filed with the demand
pages NONE _____, filed with the letter of _____.

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language _____ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in printed form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☒ The amendments have resulted in the cancellation of:

- ☒ the description, pages None
- ☒ the claims, Nos. 17,18,22 and 24
- ☒ the drawings, sheets/fig None

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. STATEMENT**

Novelty (N)	Claims <u>1-8,10,11,13,14 and 17-25</u>	YES
	Claims <u>9,12,15 and 16</u>	NO
Inventive Step (IS)	Claims <u>1-8,10,11 and 17-25</u>	YES
	Claims <u>9, 12-16</u>	NO
Industrial Applicability (IA)	Claims <u>1-25</u>	YES
	Claims <u>NONE</u>	NO

2. CITATIONS AND EXPLANATIONS

Claims 9, 12, 16 lack novelty under PCT Article 33(2) as being anticipated by Yasuda et al. (4,840,916). Yasuda et al. discloses a method of fabricating a planar avalanche photodiode comprising the following steps : providing a first n-type semiconductor layer 2 defining a contact area 12 wherein an n-type contact layer 1 being disposed adjacent to the first n-type semiconductor layer 2; depositing a second n-type semiconductor layer 18 having a p-type diffusion region 8; depositing an n-type semiconductor multiplication layer 5; depositing an n-type semiconductor absorption layer 3; depositing a p-type contact layer 17 wherein the p-type diffusion region 8 is disposed directly adjacent to the p-type contact layer 17; wherein the p-type diffusion region 8 having a smaller area than the n-type semiconductor layer 18, thereby decreasing the capacitance of the planar avalanche photodiode. Note figure 3 of Yasuda et al.

Claims 13-15 lack an inventive step under PCT Article 33(3) as being obvious over Yasuda et al. (4,840,916). Yasuda et al. does not disclose the first and second n-type semiconductor layers are InAlAs; the multiplication layer is InAlAs and the absorption layer is InGaAs. Although Yasuda et al. device does not teach exact the material of the first and second n-type semiconductor layers, the multiplication layer and the absorption layer as that claimed by Applicant, the material differences are considered obvious design choices and are not patentable unless unobvious or unexpected results are obtained from these changes. It appears that these changes produce no functional differences and therefore would have been obvious. Note In re Leshin, 125 USPQ 416, In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Circ. 1990).

Claims 9, 12, 15, 16 lack novelty under PCT Article 33(2) as being anticipated by Watanabe (5,552,629). Watanabe discloses a planar avalanche photodiode comprising a first n-type semiconductor layer 31 defining a contact area wherein an n-type contact layer 38 being disposed adjacent to the first n-type semiconductor layer 31; a second n-type semiconductor layer 32; a semiconductor multiplication layer 33; a semiconductor absorption layer 35; a p-type contact layer 37; a p-type diffusion region 36 is disposed directly adjacent to the p-type contact layer 37 and having a smaller area than the semiconductor layer 32, thereby decreasing the capacitance of the planar avalanche photodiode. Note figure 1 of Watanabe. Note that Applicant's claim 9 does not recite the semiconductor absorption layer being disposed between the semiconductor multiplication layer and the semiconductor layer having the p-type diffusion region as recited in claims 1-8 and 17-25.

Claims 13 and 14 lack an inventive step under PCT Article 33(3) as being obvious over Watanabe (5,552,629). Watanabe does not disclose the first and second n-type semiconductor layers are InAlAs. Although Watanabe device does not teach exact the material of the first and second n-type semiconductor layers as that claimed by Applicant, the material differences are considered obvious design choices and are not patentable unless unobvious or unexpected results are obtained from these changes. It appears that these changes produce no functional differences and therefore would have been obvious. Note In re Leshin, 125 USPQ 416, In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Circ. 1990).

Claims 1-8, 10, 11, 17-25 meet the criteria set out in PCT Article 33(2)-(3), because the prior art does not teach or fairly suggest at least one grading layer disposed adjacent to the n-type semiconductor absorption layer as recited in claim 10; a p-type semiconductor charge control layer disposed adjacent to the n-type semiconductor multiplication layer as recited in claim 11 and the semiconductor absorption layer being disposed between the semiconductor multiplication layer and the semiconductor layer having the p-type diffusion region as recited in claims 1-8 and 17-25.

NEW CITATIONS

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted: